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*(Continued on Inside Back Cover)*

THE JOURNAL OF
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# FACTORS RELATING TO THE ACADEMIC ACHIEVEMENT OF HIGH-SCHOOL STUDENTS

HARRISON G. GOUGH

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The prediction of academic achievement has been a problem of continuing interest to psychologists. Recourse has ordinarily been had to tests of ability and capacity, but recently there has been a growing realization that other, non-intellectual, factors must be assessed if the margin of predictive error is to be diminished appreciably.[3]

The measurement of these non-intellectual factors in a way permitting their use in forecasting has proved to be a difficult task. Stagner,[20] reviewing a number of previous studies in 1933, found only negligible relationships between personality tests and grade averages. He did find slight tendencies for students with higher scores on the introversion, dominance, and self-sufficiency sections of the Bernreuter Personality Inventory to obtain higher grade averages than those with lower scores. Nemzek[18] also used the Bernreuter Inventory, but found no relationship with teachers' grades.

Harris[13] found motivation to be the most important non-intellectual factor in his study of college achievement, followed by other personal, social, and economic characteristics. Eckert[7] discovered a slight achievement trend in favor of introverts, and also a tendency for the better students to hold more liberal social attitudes; she felt that the differences were sufficiently marked to warrant the inference that the superior student has a different outlook on life from the inferior student.

No significant results were obtained in a study of college students by Griffiths[12] comparing honor point ratio (HPR) with Bell Adjustment Inventory scores. Adjustment scores of men with brilliant academic records were not significantly different from those of men on probation, men with unsatisfactory Bell scores

had grade averages insignificantly different from those with good adjustment, and, finally, men classed as very unsatisfactory on either the health or emotional adjustment subscale had grade averages insignificantly different from men classed as excellent on the corresponding scale. On the other hand, the writer[11] found low, but consistently negative, correlations between the Brown Personality Inventory and five achievement tests in a population of sixth-grade children—the tendency was for the more maladjusted pupils to secure lower achievement test scores.

Studies such as the above have not provided any unequivocal or practically very useful conclusions. One reason for this may be that they have tended to use scale scores from instruments which were devised for use in other prediction problems, often clinical, and with no intended relationship to the variables relevant to academic achievement. For example, there is no reason to expect that a scale designed to reveal neuroticism would discriminate either under- or over-achievers as a group.

An excellent research by Borow[4] has obviated this criticism by submitting a specially created pool of three hundred ninety-nine items to individual analysis in order to select those reliably differentiating students earning at least one probable error over their predicted HPR from those falling at least one probable error below their predicted HPR. Using two validating groups, one hundred vs. one hundred women and ninety-five vs. ninety-five men, ninety items were retained; the items were categorized as follows: curricular adjustment; maturity of goals and level of aspiration; personal efficiency and good time-budgeting; effective study skills; mental health; and, adequate personal relations with faculty and associates. The total scale gave correlations in the neighborhood of .30 in test samples, combining with ability tests to yield multiple correlations of .50, against grade averages.

The Minnesota Multiphasic Personality Inventory has also been studied in regard to academic achievement. Bolander[2] predicted HPR on the basis of the Ohio Psychological Examination, and then chose extreme deviates in both directions from a class of two hundred eighteen college students, getting fifty-nine under- and over-achievers, respectively. In comparing these groups on the MMPI he found significantly higher Pd and Ma scores for the under-achievers, and a tendency for higher Pt scores in the under-achieving group; also, of eleven students in the total

group of two hundred eighteen who had Pd scores over 70, nine were in the under-achieving subgroup.

Owens[19] used the shortened form of the MMPI (three hundred diagnostic items only) in conjunction with several other tests in a study of collegiate under-achievement. Averages were predicted on the basis of A.C.E. scores, permitting the categorization of one hundred sixty-four engineering freshmen into three groups: under-achievers, over-achievers, and normal achievers. Using tetrachoric correlations, items were selected which gave values of at least .20 with under-achievement, and in which over-achievers differed in the same direction from normals as did the normals from the under-achievers. In all, thirty-eight items were obtained, of which seven came from the MMPI. Fifteen items dealt with social adjustment, the under-achievers without exception giving the more acceptable response; the appearance of these fifteen items was quite striking in view of the fact that the original pool of five hundred nineteen contained only sixty referring to this area. Owens' summary was that the under-achievers were too socially oriented, probably too active, and that a slight tendency towards depression, worry, and psychic tension was a consequence of poor achievement rather than a cause of it.

Another item analysis of the MMPI was carried out by Altus,[1] using an over-achieving vs. an under-achieving group (twenty-five in each), selected by means of discrepancies between standard scores on a measure of verbal aptitude and an achievement test in psychology. Altus obtained sixty items, which he felt revealed trends of immaturity, femininity, and social extraversion for the under-achievers. On the MMPI scales the only significant mean difference was on Ma, where under-achievers were higher. The correlation of the sixty items with a composite criterion of four psychology tests was .39, in the original class from which, the criterion groups were drawn; the correlation with the measure of verbal aptitude was .15. A later analysis of the sixty items in regard to HPR, using an upper-lower quartile method, produced a subset of twenty-six which significantly discriminated grade average. These twenty-six items correlated .40 with the psychology criterion, but showed an increased $r$ with verbal aptitude, .21. The twenty-six items also correlated .39 with HPR, whereas the original sixty had given an $r$ of .23.

These findings, however, must be considered with some reser-

vations, for only twenty-one of the sixty items on which Altus bases his discussion are statistically significant at the five per cent level. Also, the sexual disparity between his criterion groups (twenty-two males, three females in the achieving group, nine males, sixteen females in the non-achieving group) may well have produced an excess of feminine-interest items which would not hold up under cross-validation. Finally, the mean comparison of the achieving and non-achieving groups on pooled Mf scores creates a difficult interpretational problem inasmuch as high scores for males indicate femininity, whereas high scores for females betoken masculinity.[14]

Brown[5] has also conducted an item analysis of the MMPI in regard to collegiate achievement. Using standard scores on the Ohio Psychological Examination as a point of reference, he selected fifty-five over-achievers, twenty-two under-achievers, and fifty normal achievers, by comparing standard scores based on HPR. Forty-five items emerged from this analysis, of which thirty reached or exceeded the five per cent level in separating under- from over-achievers. Items characterizing the under-achiever suggested a tendency to deny personal problems, to see others in a favorable light, to minimize somatic complaints, and to be self-satisfied. Considered as a scale, the forty-five items did not predict HPR adequately, correlating −.12 with grades, and −.33 with the Ohio Psychological Examination. Brown did not compare means of the criterion groups.

On the other hand, a profile analysis similar to that outlined in a previous paper of the present writer[8] was carried out, and showed that of students with quasi-neurotic profiles significantly more were over-achieving and significantly fewer under-achieving than for those with normal profiles. Similarly, for cases with Pd spikes, significantly more of those with peaks from 60–70 were over-achievers than of normals, but this was not true for those over 70. Of those profiles with D scores over 70, significantly more were over-achievers than among normals, and likewise for cases in which Mf exceeded 60.

Considering all of the studies mentioned, the only one which has given any really convincing evidence of a set of non-intellectual predictors is that of Borow.[4] Brown's items did not correlate significantly with grades. Altus found a good correlation in the original sample, but did not cross-validate, and certain fea-

tures of his method suggest that his scale would not hold up to this level. Owens did not treat his items as a scale, nor did he cross-validate; hence, the predictive value of his items cannot be evaluated. The other studies dealt only with scale scores, and did not yield any results which could readily be used in predicting academic achievement. A rather discouraging feature of the three MMPI item analyses is the fact that only one item duplication occurred,* and even here the direction of scoring was reversed.

## PRESENT STUDY

The present study is also primarily an item analysis of the MMPI to determine whether a set of items can be isolated which will constitute reliable predictors of honor point ratio independently of intelligence. From a group of two hundred thirty-one high-school seniors in a small Midwestern city, two criterion samples of twenty-seven each were chosen (fourteen girls, thirteen boys). Pairs were matched on Otis IQ and sex, and then split according to a three-year high school HPR; a difference of one full honor point (where A is 4, B 3, C 2, etc.) was required before being included in the criteria. These two groups were then compared on the following factors: MMPI; Security-Insecurity Inventory;[16,9] Otis IQ; Pintner IQ; HPR; and socio-economic status as determined by the Sims Score Cards.

Only one of the eighteen variables considered revealed a statistically significant difference between the two groups, that one being HPR, the selection variable itself. The chief difference between the two groups would appear to be, then, on the relevant variable, academic achievement. Another factor which should be noted is the wide range of intelligence sampled. Both groups contained cases of quite high and quite low ability; the standard deviations for both criterion groups on the Otis and Pintner tests were almost identical with the standard deviations for the total sample of 231.†

Item analysis was carried out by means of phi coefficients,[15] with thirty-four items appearing at or beyond the five per cent

* Considering only items significant at or beyond the five per cent level; the overlap was between the Brown[5] and Owens[19] studies.

† Workers interested in obtaining a table giving the sample statistics and mean comparisons may do so by writing to the author.

level. These items and their direction of scoring for high achievement are given in Table 1.

A pooled summary of subjective cluster analyses by seven judges suggests that the items may be categorized somewhat as follows: (1) Extreme conformity to manifest social norms, rigidity, and submissiveness to parental standards, items 116, 205, 224, 235, 294, 378, 419, 457, and 460; (2) Symptoms of moderate tension, anxiety, insecurity, and a somewhat suspicious attitude towards others, items 13, 43, 104, 106, 124, 186, 230, 242, 251, 263, 301, 357, 361, 436, 438, and 442; (3) Efficient interpersonal behavioral skills, items 353, 381, 408, and 498; (4) Miscellaneous, including feminine tendencies, 149 and 300; denial of gross abnormality, 66 and 334; and an interest in reading history, 546.

TABLE 1.—PERSONALITY INVENTORY ITEMS SIGNIFICANTLY DIFFERENTIATING BETWEEN TWENTY-SEVEN ACHIEVING AND TWENTY-SEVEN NON-ACHIEVING HIGH-SCHOOL STUDENTS EQUATED FOR INTELLIGENCE

| Item Number in MMPI Group Form | Item | Answered by Achievers as: | Critical Ratio |
|---|---|---|---|
| 13. | I work under a great deal of tension. | True | 2.39 |
| 43. | My sleep is fitful and disturbed. | True | 2.31 |
| 66. | I see things or animals or people around me that others do not see. | False | 2.84 |
| 104. | I don't seem to care what happens to me. | False | 2.26 |
| 106. | Much of the time I feel as if I have done something wrong or evil. | True | 2.26 |
| 116. | I enjoy a race or game better when I bet on it. | False | 1.96 |
| 124. | Most people will use somewhat unfair means to gain profit or an advantage rather than to lose it. | True | 1.96 |
| 149. | I used to keep a diary. | True | 2.29 |
| 186. | I frequently notice my hand shakes when I try to do something. | True | 2.66 |
| 205. | At times it has been impossible for me to keep from stealing or shoplifting something. | False | 2.09 |

TABLE 1.—(*Continued*)

| Item Number in MMPI Group Form | Item | Answered by Achievers as: | Critical Ratio |
|---|---|---|---|
| 224. | My parents have often objected to the kind of people I went around with. | False | 1.96 |
| 230. | I hardly ever notice my heart pounding and I am seldom short of breath. | False | 1.96 |
| 235. | I have been quite independent and free from family rule. | False | 2.15 |
| 242. | I believe I am no more nervous than most others. | False | 2.39 |
| 251. | I have had blank spells in which my activities were interrupted and I did not know what was going on around me. | True | 2.09 |
| 263. | I sweat very easily even on cool days. | True | 1.96 |
| 294. | I have never been in trouble with the law. | True | 2.13 |
| 300. | There never was a time in my life when I liked to play with dolls. | False | 1.96 |
| 301. | Life is a strain for me much of the time. | True | 2.26 |
| 334. | Peculiar odors come to me at times. | False | 2.18 |
| 353. | I have no dread of going into a room by myself where other people have already gathered and are talking. | True | 2.43 |
| 357. | I have several times given up doing a thing because I thought too little of my ability. | True | 2.01 |
| 361. | I am inclined to take things hard. | True | 2.90 |
| 378. | I do not like to see women smoke. | True | 2.34 |
| 381. | I am often said to be hotheaded. | False | 2.07 |
| 408. | I am apt to hide my feelings in some things, to the point that people may hurt me without their knowing about it. | False | 2.61 |
| 419. | I played hooky from school quite often as a youngster. | False | 1.97 |
| 436. | People generally demand more respect for their own rights than they are willing to allow for others. | True | 1.97 |

TABLE 1.—(*Continued*)

| Item Number in MMPI Group Form | Item | Answered by Achievers as: | Critical Ratio |
|---|---|---|---|
| 438. | There are certain people whom I dislike so much that I am inwardly pleased when they are catching it for something they have done. | True | 2.20 |
| 442. | I have had periods in which I lost sleep over worry. | True | 2.34 |
| 457. | I believe that a person should never taste an alcoholic drink. | True | 2.39 |
| 460. | I have used alcohol moderately (or not at all). | True | 1.97 |
| 498. | It is always a good thing to be frank. | False | 2.26 |
| 546. | I like to read about history. | True | 1.96 |

The next step was to treat the items as a scale and determine its validity and reliability. In the original class of two hundred thirty-one students the scale, called 'Ac' hereafter, correlated .43 with three-year HPR, and .11 with Otis I.Q.; the $r$ between Otis and HPR was .62. The split-half (corrected) reliability was .62, which is too low for individual use and guidance; test-retest reliability has not as yet been established, although previous experience with scales of this kind[10] would suggest that it would be higher. In a new class of two hundred seventy-two cases (one hundred forty-five boys, one hundred twenty-seven girls) the correlation of Ac and HPR was .25, with Otis −.02, and of Otis with HPR .62. The multiple $r$ of Ac and Otis with HPR was .68. All these correlations, except for Ac vs. Otis, are significant well beyond the one per cent level, and indicate that the Ac scale does have significant, although low, validity for its criterion.

The Ac scale was also tested in a special sample of ninth-grade students, chosen in the same way as the original criterion groups. The ninth-grade subsamples included sixteen each (thirteen boys, three girls) matched for intelligence, but separated according to eighth-grade HPR. Table 2 gives the result of this analysis. The Ac scale does discriminate reliably between the two groups, but the amount of overlap is very great.

It was also felt of interest to compare Ac, Otis IQ, and HPR with a number of additional variables, to determine what other factors might predict HPR, and also to see more clearly what Ac was associated with. Table 3 presents these results. Correlations significant at the one per cent level indicate that Ac is related to reservedness and defensiveness in response to personal inquiry (see reference 17), moderate depression, femininity for both sexes, social introversion, insecurity, and a tendency towards compulsive or psychasthenic responses on the MMPI.

TABLE 2.—COMPARISON OF SIXTEEN NINTH-GRADE STUDENTS (13 BOYS, 3 GIRLS) WITH SUPERIOR ACADEMIC RECORDS VERSUS SIXTEEN STUDENTS WITH INFERIOR ACADEMIC RECORDS, BUT MATCHED FOR INTELLIGENCE

| | Achievers | | Non-Achievers | | Diff. | *t* |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| Otis IQ | 107.06 | 10.72 | 106.63 | 10.26 | 0.43 | 0.11 |
| Honor Point Ratio* | 3.08 | 0.42 | 2.06 | 0.32 | 1.02 | 7.50 |
| Ac | 17.88 | 2.15 | 15.50 | 2.03 | 2.38 | 3.11 |

* For work during the eighth grade.

HPR is related to relatively lower scores on the MMPI F scale (highly unusual, but not diagnostically abnormal items), greater femininity for both sexes, higher personality-status, higher objective status, and, as expected, to, the various tests of ability.

A number of the most favorable combinations suggested by Table 3 were considered in multiple correlation with HPR, as summarized in Table 4. Here the best prediction is afforded by a multiple *r* based on Otis, Coöperative English, and Ac. Even here, however, the standard error of estimate is .83, and the improvement over chance in predicting HPR is only forty per cent. Also, only this combination, which would be time-consuming to use, is clearly superior to Coöperative English taken alone. An interesting additional feature of Table 4 is the multiple *r* between Ac and St with HPR, showing the extent to which

TABLE 3.—INTERCORRELATIONS OF THE Ac SCALE, OTIS IQ, AND THREE-YEAR HIGH SCHOOL HONOR POINT RATIO WITH THE VARIABLES INDICATED, BASED ON A SAMPLE OF TWO HUNDRED THIRTY-ONE HIGH SCHOOL SENIORS (97 BOYS, 134 GIRLS)†‡

| | Ac | Otis | HPR |
|---|---|---|---|
| MMPI | | | |
| Scales: L | −.04 | −*.20* | −.12 |
| K | −*.19* | .14 | −.08 |
| F | −.05 | −*.25* | −*.21* |
| Hs | .03 | −.01 | −.05 |
| D | *.23* | −.05 | −.05 |
| Hy | .08 | .02 | −.04 |
| Pd | −.08 | −.12 | −.17 |
| Mf (boys) | *.33* | *.31* | *.35* |
| Mf (girls) | −*.29* | −*.29* | −*.31* |
| Pa | .15 | .03 | .01 |
| Pt | *.27* | .00 | −.09 |
| Sc | .04 | −.04 | −.13 |
| Ma | −.06 | −.09 | −.15 |
| Si* | *.24* | −.06 | .03 |
| St§ | −.11 | *.40* | *.27* |
| Ac | | .11 | *.43* |
| Security-Insecurity | *.25* | −.09 | −.01 |
| Sims Score Cards | .01 | *.33* | *.25* |
| Otis IQ | .11 | | *.62* |
| Pintner IQ | .13 | *.78* | *.62* |
| A.C.E. | .11 | *.83* | *.62* |
| Coöp. Engl. | .21 | *.72* | *.73* |
| Honor Point Ratio | *.43* | *.62* | |

* Social introversion; see reference 6.

† Except for the following N's: Mf (boys)—97; Mf (girls)—134; A.C.E. and Coöperative English—133 (59 boys, 74 girls).

‡ Correlations significant at the one per cent level are in italics.

§ Status; see reference 10.

HPR could be predicted from personality variables alone; this *r* is equivalent to that usually found between intelligence tests and HPR in college groups,[3] (p. 16).

The Ac scale was also tried out in several college samples. In one sample of forty-four it correlated insignificantly different

from zero with numerical score on a psychology final examination, in another sample of thirty-nine insignificantly with HPR. It may be that different non-intellectual factors enter into high-school and college achievement; at any rate, the present scale had no predictive utility in the latter situation.

Comparing the Ac scale with the analyses of Altus, Brown, and Owens, five item duplications are found (considering only items significant at or beyond the five per cent level). Two items duplicate with the Altus scale (146 and 263), and three with the Brown scale (124, 242, and 438); all score in the same direction.

Although the present scale is offered as only tentative and preliminary, other workers may desire to consider it in further studies of the problem. For this reason a T-score conversion table (Table 5) is given below, based on six hundred seventy-six high-school students from two different Minnesota communities.

TABLE 4.—MULTIPLE CORRELATIONS OF THREE-YEAR HIGH SCHOOL HONOR POINT RATIO WITH THE VARIABLES INDICATED

| Otis and Pintner | Otis and Ac | Otis and ACE* | Otis and Coöp. Engl.* | Ac and Pintner | Ac and ACE* | Ac and Coöp. Engl.* | Ac and St | ACE and Coöp. Engl. | Otis, Coöp. Engl. and Ac* |
|---|---|---|---|---|---|---|---|---|---|
| .66 | .72 | .65 | .74 | .71 | .72 | .78 | .54 | .73 | .80 |

* Approximate; gross correlations based upon unequal N's.

## SUMMARY

A brief review of certain of the studies of non-intellectual factors relating to academic achievement indicated that introversion, dominance, self-sufficiency, good motivation, liberal social attitudes, and lack of maladjustment were all characteristics found among achievers. A more penetrating analysis revealed that curricular satisfaction, maturity of goals, efficiency of planning and working, and adequate personal and social orientations also pertain to better achievement. On the MMPI high scores on Ma, Pd, or Pt may portend under-achievement; items which reflect lack of emotional tension, immaturity, social extraversion, disinclination to admit personal problems, and a tendency to see others in a favorable light, have all been found predictive of under-achievement by various investigators.

The present study has revealed a number of factors related to academic achievement among high-school students, not all of which are identifiable with those noted above. For example, none of the MMPI scales discriminated between the achieving

TABLE 5.—T-SCORE CONVERSION TABLE FOR Ac, BASED ON 676 HIGH-SCHOOL STUDENTS (331 BOYS, 365 GIRLS)*

| Raw Score | T Score | Raw Score | T Score |
|---|---|---|---|
| 34 | 106 | 16 | 47 |
| 33 | 103 | 15 | 43 |
| 32 | 100 | 14 | 40 |
| 31 | 96 | 13 | 37 |
| 30 | 93 | 12 | 33 |
| 29 | 90 | 11 | 30 |
| 28 | 86 | 10 | 27 |
| 27 | 83 | 9 | 24 |
| 26 | 80 | 8 | 20 |
| 25 | 77 | 7 | 17 |
| 24 | 73 | 6 | 14 |
| 23 | 70 | 5 | 10 |
| 22 | 67 | 4 | 7 |
| 21 | 63 | 3 | 4 |
| 20 | 60 | 2 | 0 |
| 19 | 57 | 1 | 0 |
| 18 | 53 | 0 | 0 |
| 17 | 50 | | |

* High scores refer to higher achievement.

and non-achieving groups in this study. This may reflect the different qualities tapped in high-school achievement, or may imply the futility of the entire quest for stable non-intellectual predictors. The fact that the personality scale discussed in this study does possess some validity in new samples suggests that the latter, in any case, is not true. The low predictive power of this scale, however, does indicate that more research is needed, probably starting with a wider range of items than provided by the MMPI, and designed to incorporate the clues and hypotheses inherent in this and previous studies.

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# PROBLEMS OF COLLEGE STUDENTS[1]

RUTH A. HUNTER AND DAVID H. MORGAN

Colorado Agricultural and Mechanical College

In the thirty years since Boraas[3] studied the difficulties which sophomores and upper-classmen had experienced as freshmen, a number of investigations have been made on the adjustment of students to college life. These investigations reveal that many students are disturbed by such problems as 'how to study effectively,' 'too little time for so many subjects,' 'social activities,' 'emotional difficulties' and 'selecting courses.' Problems pertaining to studying effectively have constituted, in general, half of all the difficulties reported, and academic problems were reported more frequently than were personal problems.

It is significant to note that the same problems have appeared in the various investigations throughout these years. Likewise the most common recommendations have been: 'more guidance in the selection of courses,' 'mental hygiene classes,' and 'orientation programs of personal conferences with freshmen.'

With the present change in the student body of our colleges and the large influx of older students, many of whom are married and have children, a study of problems confronting students seems particularly pertinent. The answers to the following questions were sought in a recent investigation[9] at Colorado Agricultural and Mechanical College:

1) What are the problems confronting the students?

2) What problems are characteristic of men as contrasted with women?

3) What problems are characteristic of freshmen as contrasted with other students?

## THE PRESENT INVESTIGATION

Problems which students have expressed to the writers and problems found in the reports of other investigations were used as a foundation for constructing a Personal Interview Form.[9] Seven major problem areas with a total of seventy-eight items

[1] Submitted in partial fulfillment of the requirements for the Master's degree. Published by special permission of the Dean of the Graduate School, Colorado Agricultural and Mechanical College.

were constructed. These areas were: Academic Education, General Education, Vocation, Personal and Social Adjustment, Family, Health, and Finance.

One hundred men students and one hundred women students were selected at random from the list of students enrolled in college during 1945–46. These students were interviewed during the Spring Quarter in 1946. An average of thirty-five minutes was taken for each interview. With the exception of three students, there was marked interest shown in the study. Some of the students commented that the study should have been made earlier so that it would have been of help to them. Their reactions constituted sufficient evidence to demonstrate that there was a need for this study.

*Description of Sample.*—Of the two hundred students interviewed, ninety-two were freshmen, forty-seven were sophomores, thirty-six were juniors, and twenty-five were seniors. The proportions agreed quite closely with the composition of the student body at that time.

Twenty per cent of the men and five per cent of the women were married, as shown in Table 1. Over half of the men (fifty-eight per cent) were veterans. About two-thirds of the men and eight per cent of the women were entirely self-supporting. The average age of the men was 2.6 years higher than that of the women.

TABLE 1.—DESCRIPTION OF SAMPLE ACCORDING TO CERTAIN PERSONAL CHARACTERISTICS OF STUDENTS

| | Men N = 100 | Women N = 100 |
|---|---|---|
| Marital Status—Married | 20 | 5 |
| Single | 80 | 95 |
| Veteran—Yes | 58 | 1 |
| No | 42 | 99 |
| Percentage of Self-Support— 0 | 32 | 47 |
| 1–49 | 0 | 32 |
| 50–99 | 2 | 13 |
| 100 | 66 | 8 |
| Age—Average | 22.5 | 19.9 |
| Range | 18–27 | 17–26 |

*Problems Confronting Students.*—Since space does not permit the inclusion of all problems here, only those which were reported by one-fifth or more of the entire group will be discussed. Of the seventy-eight items contained in the Personal Interview Form, eleven met this criterion (Table 2).

TABLE 2.—PROBLEMS REPORTED BY ONE-FIFTH OR MORE OF SAMPLE

| Problems | Percentage of students Reporting (N = 200) |
|---|---|
| Academic Education: | |
| Studying effectively | 33.0 |
| Concentrating during study hours | 29.0 |
| General Education: | |
| Budgeting study time | 44.0 |
| Planning extra-curricular activities not to interfere with academic work | 30.5 |
| Personal and Social Adjustment: | |
| Being self-conscious | 26.0 |
| Speaking in public | 21.5 |
| Lacking in self-confidence | 24.0 |
| Wanting a more pleasing personality | 23.0 |
| Finance: | |
| Buying and spending wisely | 27.5 |
| Desiring to start a home | 27.0 |
| Family: | |
| [No problem reported by more than 8.5 per cent of entire group] | |
| Health: | |
| Lacking rest and sleep | 27.5 |
| Vocation: | |
| None | |
| ['Choosing a Vocation' highest with nineteen per cent.] | |

The main problems in order of frequency were 'Budgeting study time,' 'Studying effectively,' 'Planning extra-curricular activities not to interfere with academic events,' and 'Concen-

TABLE 3.—PROBLEMS SHOWING SIGNIFICANT DIFFERENCES BETWEEN MEN AND WOMEN STUDENTS AT COLORADO A. AND M. COLLEGE, 1945–46

| Problems | Significance of Differences of Percentages | | |
|---|---|---|---|
| | D* | $SE_D$ | t |
| Academic Education: | | | |
| Concentrating during study hours. | 42 | 5.7 | 7.4 |
| Expressing knowledge in recitation. | 28 | 4.5 | 6.2 |
| Carrying out laboratory procedures. | 19 | 3.7 | 5.1 |
| Worrying excessively about examinations. | 20 | 4.7 | 4.3 |
| Expressing knowledge in writing. | 16 | 4.9 | 3.3 |
| Concentrating in class. | 15 | 4.7 | 3.2 |
| Getting satisfactory grades. | 14 | 5.3 | 2.6 |
| Finding library references. | −12 | 5.3 | −2.3 |
| Studying effectively. | 14 | 6.6 | 2.1 |
| Outlining or taking notes. | −11 | 5.4 | −2.0 |
| General Education: | | | |
| Selecting courses in line with vocation. | 21 | 4.1 | 5.1 |
| Understanding methods of grading. | 18 | 4.4 | 4.1 |
| Planning extra-curricular activities not to interfere with academic school life. | 19 | 6.4 | 3.0 |
| Vocation: | | | |
| Choosing a vocation. | 34 | 5.0 | 6.8 |
| Being satisfied with your vocation. | 29 | 5.0 | 5.8 |
| Concerning the future of vocation. | 24 | 4.5 | 5.3 |
| Evaluating suitability for vocation. | 24 | 4.8 | 5.0 |
| Getting vocational information. | 18 | 4.2 | 4.3 |
| Finding no interest in any vocation. | 6 | 2.7 | 2.2 |
| Personal and Social Adjustment: | | | |
| Speaking in public. | 37 | 5.2 | 7.1 |
| Finding time for shows, sports, radio. | 22 | 4.1 | 5.4 |
| Being self-conscious. | 28 | 5.9 | 4.7 |
| Conversing with people. | 21 | 4.6 | 4.6 |
| Selecting activities in line with interests. | 11 | 3.4 | 3.2 |

TABLE 3.—(*Continued*)

| Problems | Significance of Differences of Percentages | | |
|---|---|---|---|
| | D* | $SE_D$ | t |
| Being ill at ease at social affairs. | 17 | 5.5 | 3.1 |
| Wishing for fewer social contacts. | 7 | 2.6 | 2.7 |
| Taking things too seriously. | 33 | 5.0 | 6.6 |
| Getting nervous easily. | 30 | 4.7 | 6.4 |
| Being discouraged easily. | 29 | 5.0 | 5.8 |
| Lacking in self-confidence. | 32 | 5.6 | 5.7 |
| Fearing criticism. | 29 | 5.1 | 5.7 |
| Fearing you will make social mistakes. | 20 | 4.5 | 4.4 |
| Having the blues often. | 19 | 4.5 | 4.2 |
| Being upset when you have to recite. | 16 | 4.3 | 3.7 |
| Wanting to confide in someone. | 17 | 4.8 | 3.5 |
| Lacking in leadership ability or opportunity. | 15 | 4.4 | 3.4 |
| Being hurt easily. | 14 | 4.1 | 3.4 |
| Having sleepless nights because of overactive mind | 10 | 3.0 | 3.3 |
| Worrying about what to wear. | 11 | 4.1 | 2.7 |
| Dreading to introduce folks at a party. | 7 | 2.6 | 2.7 |
| Wanting religious advice. | 6 | 2.4 | 2.5 |
| Fearing lack of success in life. | 9 | 3.7 | 2.4 |
| Worrying about national or world-wide problems. | 8 | 3.8 | 2.1 |
| Family: | | | |
| Family living quarters unsatisfactory. | −14 | 3.7 | −3.8 |
| Family living quarters provide no suitable place to study. | −13 | 3.6 | −3.6 |
| Health: | | | |
| Becoming tired easily. | 20 | 5.3 | 3.8 |
| Intermittent illness causing absence from classes. | 10 | 3.0 | 3.3 |
| Having poor complexion. | 12 | 3.7 | 3.2 |
| Being nervous over trifles. | 11 | 4.1 | 2.7 |

TABLE 3.—(*Continued*)

| Problems | Significance of Differences of Percentages | | |
|---|---|---|---|
| | D* | $SE_D$ | t |
| Finance: | | | |
| Supporting wife and/or children. | −13 | 3.4 | −3.8 |
| Desiring to start a home. | −22 | 6.1 | −3.6 |
| Getting enough money for college fees. | 9 | 2.9 | 3.1 |
| Worrying about parental sacrifices. | 14 | 4.7 | 3.0 |
| Buying and spending wisely. | 17 | 6.2 | 2.7 |

* A positive value indicates a higher incidence for women than for men.

trating during study hours.' Problems dealing with education—academic and general—were then more prevalent than were problems in any other area.

The main problems under Personal and Social Adjustment were closely related, 'Being self-conscious,' 'Speaking in public,' 'Lacking in self-confidence,' and 'Wanting a more pleasing personality.'

Two problems in the area of Finance were checked by slightly more than one-fourth of the entire group—'Buying and spending wisely' and 'Desiring to start a home.'

Under Health, the main problem was 'Lacking rest and sleep.'

*Men Contrasted with Women.*—As shown in Table 3, a significant difference was found between the responses of the two sexes to fifty-six of the seventy-eight items. On only six of the fifty-six was the number of men indicating the problem significantly higher than that of the women. Differences between the sexes were found in all eight areas. In four of the areas—General Education, Vocation, Adjustment, and Health—the percentage of the women with the specific problem was higher than that of the men. As would be expected, more men than women indicated problems in the area Family.

*Freshman Men Contrasted with Other Men Students.*—Since as shown in the above stiecon, the problems vary between the sexes, the data will be analyzed in this section according to sex. The

problems listed by the men were decidedly fewer in number following the freshman year (Table 4). There were fifteen problems in six areas which showed significant differences in percentages between freshman men and other men students. Of this number on only three were the other men students higher than the fresh-

TABLE 4.—PROBLEMS SHOWING SIGNIFICANT DIFFERENCES BETWEEN FRESHMAN MEN AND OTHER MEN STUDENTS AT COLORADO A. AND M. COLLEGE, 1945–46

| Problems | Significance of Differences of Percentages | | |
|---|---|---|---|
| | D* | $SE_D$ | t |
| Academic Education: | | | |
| Outlining or taking notes. | 43.6 | 6.7 | 6.5 |
| Finding library references. | 41.8 | 6.7 | 6.2 |
| Understanding class lectures. | 30.9 | 6.2 | 5.0 |
| Studying effectively. | 35.2 | 7.7 | 4.6 |
| Concentrating during study hours. | 14.5 | 4.8 | 3.0 |
| Feeling at ease with professors. | 20.2 | 7.5 | 2.7 |
| Getting satisfactory grades. | 14.1 | 5.4 | 2.6 |
| Concentrating in class. | 7.3 | 3.5 | 2.1 |
| General Education: | | | |
| Budgeting study time. | 36.0 | 7.0 | 5.1 |
| Vocational: | | | |
| Deciding upon prospective employment. | −17.8 | 5.7 | −3.1 |
| Personal and Social Adjustment: | | | |
| Fitting into pattern of college life. | 11.9 | 5.8 | 2.1 |
| Having difficulty accepting regulations of the college. | 7.3 | 3.5 | 2.1 |
| Worrying about what to wear. | 7.3 | 3.5 | 2.1 |
| Health: | | | |
| Limiting physical handicaps. | −4.9 | 1.9 | −2.6 |
| Being nervous over trifles. | −8.9 | 4.3 | −2.1 |

* A positive value indicates a higher incidence for freshman men than for other men.

men: 'Deciding upon prospective employment,' 'Limiting physical handicaps' and 'Being nervous over trifles.' More than half of these problems were in the area Academic Education.

*Freshman Women Contrasted with Other Women.*—The freshman women were significantly higher than the other women students in only four problems and lower on two. In general the freshman women were bothered more by 'Expressing knowledge in writing,' 'Being self-conscious,' 'Being upset when you have to write,' and 'Fearing criticism.' They had not become as disturbed as the other group by 'Desiring to start a home' and 'Worrying constantly about health.' (Table 5.)

TABLE 5.—PROBLEMS SHOWING SIGNIFICANT DIFFERENCE BETWEEN FRESHMAN WOMEN AND OTHER WOMEN STUDENTS AT COLORADO A. AND M. COLLEGE, 1945–46.

| Problems | Significance of Differences of Percentages | | |
|---|---|---|---|
| | D* | $SE_D$ | t |
| Academic Education: | | | |
| Expressing knowledge in writing. | 19.3 | 9.1 | 2.1 |
| Personal and Social Adjustment: | | | |
| Being self-conscious. | 22.3 | 10.1 | 2.2 |
| Being upset when you have to recite. | 21.3 | 8.6 | 2.5 |
| Fearing criticism. | 22.6 | 9.6 | 2.4 |
| Health: | | | |
| Worrying continually about health. | −6.3 | 3.0 | −2.1 |
| Finance: | | | |
| Desiring to start a home. | −12.5 | 4.5 | −2.8 |

* A positive value indicates a higher incidence for freshman women than for other women.

## DISCUSSION

In a student body such as the one under consideration there are many factors which generate a variety of problems. Because of

wartime interruptions there was a greater difference than usual between the average age of the men, 22.5, and the average age of the women, 19.9. The married men outnumbered the married women by a considerable degree, as twenty per cent of the men and only five per cent of the women were married. Fifty-eight per cent of the men included in the sample were returned war veterans. Many more of the men than of the women completely supported themselves.

*Academic Education.*—Heading the list of academic educational problems and second in rank of all problems was 'Studying effectively.' It appears that insufficient progress has been made toward the solution of this problem since it appears as the most common difficulty in the review of the literature from the earliest to the latest studies.

'Concentrating during study hours,' closely related to the above problem, likewise was a problem for the entire sample, but was significantly higher for the women than for the men. This difficulty was likewise reported more by the freshman men than by the other men. The above problems, along with the other frequently mentioned academic problems—'Outlining or taking notes,' 'Finding library references,' 'Understanding class lectures,' 'Getting satisfactory grades,' and 'Expressing knowledge in writing'—all demonstrate the need of students, especially freshmen, for assistance in adjusting to the academic aspects of college life.

*General Education.*—'Budgeting study time' headed the list of general educational problems and was first in rank of all problems confronting the students, both men and women. It is the experience of the writers that students are surprised at the number of hours in the week when they are asked to make a time schedule. As a rule, they find more time for study and for relaxation if they keep to a regular schedule since many seem to worry about not studying when they are playing and to day-dream about playing when they are supposed to be studying.

As would be expected, 'Planning extra-curricular activities not to interfere with academic school life' was the next problem in terms of frequency. This problem was mentioned by twice as many women as men. With the present ratio of five men to one woman at this college, the women are probably finding this an even greater problem.

*Vocation.*—'Choosing a vocation' was a problem that primarily concerned the women of this sample. The fact that the men were older and more mature than the women was probably one reason why the men had their vocations well determined. Also, the testing program, as administered by the Army and Navy, was a motivating influence for the veterans to seek further vocational assistance at the time of returning to college.

*Adjustment.*—As a group, the women expressed more social problems than did the men. In general, the freshman women were more self-conscious than were the other women, while the freshman men had more difficulty 'Fitting into pattern of college life' than did the other men. Very little improvement was found in solving other social problems after the first year.

Approximately one-fourth of the students in this sample reported the problem, 'Lacking in self-confidence.' It was the eighth most frequently mentioned problem. This closely agrees with Hartmann[7] who found 'Self-confidence' to be the ninth most frequently mentioned problem. In a study by Congdon[4] twenty-two per cent of the freshman men and thirty-seven per cent of the freshman women listed 'Lacking in self-confidence' as an important problem. The women of this sample reported the problem five times as often as did the men.

Another frequently mentioned problem was 'Wanting a more pleasing personality.' This problem was also quite common to students in a study by Katz and others[10] who found the most important problem upon which students desired advice to be 'Problems of own personality.' Also, in the study by Congdon[4] it was found that 'Wanting a more pleasing personality' was checked by approximately forty-four per cent of the freshmen. Hartmann[7] found 'personality' caused the students definite emotional concern as it was the third most frequently mentioned problem. Several suggestions were made by the students concerning a desire for a personality course:

"If we could have a class in personality training it would be a great help."

"There is a need for personality courses. I had orientation and philosophy of life, and I think they helped a lot."

'Wanting a more pleasing personality' was reported by the men more than twice as often as was any other problem in this area, and it was reported by more than one-fourth of the women.

One-third of the women of this sample considered that they took things too seriously, that they were discouraged easily, and that they became nervous easily. Since these problems were reported infrequently by the men, the differences between them and the women were statistically very significant.

The women reported more fears than did the men. They feared criticism, making social mistakes, lack of success in life, and having to recite. That similar fears have bothered students previously was confirmed by other studies. Blanton[2] found students indicated a 'Fear of reciting'; Congdon[4] found that freshmen frequently listed 'Afraid of making mistakes' and 'Afraid to speak up in classroom discussion'; and Hartmann[7] stated that students were "emotionally concerned about inferiority, ethical code, fears, and social graces."

Women, more frequently than men, indicated a desire to 'confide in someone.' Women also reported 'Having the blues often' and 'Being hurt easily' more frequently than did the men. Most of the emotional problems continued throughout the college years. However, the men of the other classes when compared with freshman men had successfully handled 'Having difficulty accepting regulations of the college' and 'Worrying about what to wear.' Freshmen women largely overcame the fear of criticism by the end of the first year in college. Women of this sample mentioned emotional difficulties on the average of five and one-half times more frequently than did the men. In fact, seventeen of the emotional problems were statistically significant for the women when compared with the men.

*Family.*—Comparatively few students in this sample reported problems related to the family. The problems, 'Family living quarters unsatisfactory' and 'Family living quarters provide no suitable place to study," were reported almost solely by married men who were not able to locate adequate living accommodations for themselves and their families.

*Health.*—The most frequently mentioned health problem, 'Lacking rest and sleep,' was reported by thirty-three per cent of the men.

The students made the following interesting comments concerning their crowded daily program:

"There are just too many things required of us for the time we have to do them in."

"There is too much social pressure to make good grades."

"It seems like there are too many activities."

"I don't know how to study so I stay up half of the night studying."

*Finance.*—'Buying and spending wisely' was the most frequently mentioned problem related to Finance. More than one-fourth of the students reported difficulty in this area.

## SUMMARY

In order to obtain data for the study of the problems of students at Colorado Agricultural and Mechanical College, interviews were had with one hundred men and one hundred women students. A Personal Interview Form was developed and a standard method of procedure for administering it was adopted. Seven major problem areas with a total of seventy-eight items were set up. The problem areas were Academic Education, General Education, Vocation, Personal and Social Adjustment, Family, Health, and Finance.

1) In order of decreasing frequency of mention, the following problems were reported by one-fifth or more of the students:

Budgeting study time
Studying effectively
Planning extra-curricular activities not to interfere with academic school life
Concentrating during study hours
Buying and spending wisely
Lacking rest and sleep
Desiring to start a home
Being self-conscious
Lacking in self-confidence
Wanting a more pleasing personality
Speaking in public

2) While the percentage of the men reporting various problems was statistically higher than that of the women on six problems, the percentage of women indicating that the item was a problem was very significantly higher than that of the men on thirty-seven items and significantly higher on eleven items.

3) Freshman men, contrasted with other class men, were significantly higher on twelve items and lower on three, while the

freshman women were higher than other class women on four problems and lower on two.

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# THE EFFECT UPON EYE-MOVEMENTS AND READING RATE AT THE COLLEGE LEVEL OF THREE METHODS OF TRAINING*

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## STATEMENT OF THE PROBLEM

The value of specific training in mechanics of eye movements has been one of the most controversial questions relating to methods of reading instruction. It is agreed that good readers have better eye movements than do poor readers. The crux of the controversy seems to lie in whether faulty eye movements are the cause or effect of poor reading. There are those authorities who maintain that eye movements are merely symptoms of the complex psychological processes involved in reading comprehension. Then there are others who believe that reading deficiency is produced by faulty eye movements. Be that as it may, various methods of controlled reading utilizing different mechanical devices have yielded good results.

Large gains in rate have usually resulted whenever subjects have been given an instructional set to improve their speed. Motivation appears to have been a prime factor. Perhaps the various mechanical devices have proved to be effective, in part, because of their novelty and because of the subjects' confidence in their use. The controlling aids tend to point up the problem for the subject and to set up specific goals.

Investigators have been prone to claim huge gains in comprehension. Most of the tests used to measure comprehension, however, have been timed tests. Large increases in speed have naturally brought about gains in comprehension scores.

The purpose of this experiment was to determine the relative effect of three methods of training upon eye movements and reading rate. Two of these methods utilized controlled reading practice techniques, while the third method relied upon mechanically uncontrolled reading from the printed page. In Condition I the

* Thanks are due Professor J. B. Stroud of the State University of Iowa for making this study possible and for many valuable suggestions.

Harvard Films* were employed to flash the text in phrases across and down the screen. Here mechanically controlled spacing (phrasing) and pacing obtained. In Condition II the author developed a film whereby two full lines of text were projected simultaneously. As the top line disappeared, another line would appear at the bottom. Only mechanically controlled pacing obtained in this method. In Condition III no means for mechanically controlling the reading was used. In the latter condition the subjects read printed matter under a verbal set to strive always to read as fast as was consistent with comprehension.

## PROCEDURE

*Training Material.*—The reading texts of the Harvard Films were used in all three methods. There are fifteen selections in all and they have been divided into three groups, each group being progressively more difficult. The selections in Group I average about fourteen hundred words in length; Group II about one thousand words; and those in the last group about fourteen hundred words in length.

In addition to the texts of the films, the Harvard materials consist of selections of printed material, one for each film. A set of ten comprehension questions accompanies each film; and another set with each printed selection. The printed materials are designated as equated transfer selections. They are putatively equated each with the others.

The Harvard Films material is projected from a sixteen millimeter film by phrases. After a brief exposure of a phrase it disappears and the next one in the line appears. This continues across and down the screen in the direction in which one would naturally read. The material is phrased according to the fixation span of skilled readers. It is designed to train the poor reader to increase his span of recognition by practicing with relatively large spans. The technique tends also to decrease regressions. Pacing is accomplished by varying the speed of the projector.

For the Experimental Films the text of material was taken from the Harvard Films, was transcribed, reset in Century School

* *The Harvard Films for the Improvement of Reading;* Harvard Film Service, Biological Laboratories, Harvard University, Cambridge, Massachusetts.

Book Type,[6] twelve point, and re-photographed in such a way that instead of one phrase being exposed at a time, two full lines are presented simultaneously. As a line is added from below the topmost line disappears. This continues down the screen as one would naturally read. The effect is that of pacing the student without phrasing or preventing regressions. In effect, it gives training in reading at controlled rates without attempting to achieve any mechanical control of the fixation span.

The selections were photographed on sixteen millimeter film. Except for the changes already noted, the material is arranged as in the Harvard Films—length of line in words and number of lines in a frame are the same. The projected material gives the reader the impression of a slot, wide enough to expose two lines, moving down the page. The printed material is stationary.

The same selections were printed in pamphlet form on eggshell white paper in twelve-point Century School Book Type. Care was taken to preserve the same line length as in the two sets of films. There was an average of forty lines per page. In contrast to the films, it was necessary in this method for the subject to pace himself and to do his own phrasing. He was under an instructional set to read as rapidly as possible with meaning.

*Subjects.*—College freshmen enrolled at the State University of Iowa are selected for remedial reading in communications skills if, with a few exceptions, they fall at or below the twenty-fifth percentile as determined by the Blommers[1] test. For the first semester of the 1946–47 school year the students falling in this category were sectioned at random, making up a total of nine sections. Six of these groups were chosen for this study. All subjects were at or below the twenty-fifth percentile, except for five individuals who were at the twenty-sixth percentile, three at the twenty-ninth, one at the thirty-fifth, and one at the thirty-eighth percentile.

*Method.*—A table of random numbers was used to assign methods to training sections. Two sections were trained by each method. One teacher taught three sections, using a different method with each. A second instructor trained one section using the Harvard Films and trained another section utilizing the printed page. The third instructor taught only one section; he used the Experimental Films. The training extended over a four-week period exclusive of the three-day period before and

after training. Three class periods per week were devoted to practice on the foregoing materials. There was one lecture a week dealing with improvement of reading rate and comprehension, and kindred topics.

The procedure for Groups I and II—reading from the Harvard and Experimental films, respectively—was to present a film selection at the beginning of the class period followed by an administration of the comprehension test over the film text. The film was again projected, but at a rate of fifty words per minute faster than initially.* The next steps entailed the reading of the equated transfer selection, the computation and recording of rate in words per minute, and the answering of the comprehension questions. The remainder of the period was spent in discussing certain pre-selected words from the articles read for that period. This was designed to improve students' vocabularies.

A tachometer was attached to the projector, making it possible for corresponding films of the two methods to be projected at the same speed. The first films for Groups I and II were projected at a rate of one hundred fifty words per minute. This speed was increased fifty words per minute for each succeeding film until a projection rate of four hundred words per minute was attained. This four-hundred-word-per-minute rate was then maintained for the remainder of the films.

Group III utilized the same text material except that it was read from the printed page rather than from the screen. The procedure for reading these pamphlets was similar to that of reading the equated material. In Step One the subjects were instructed to read as rapidly as was consistent with comprehension. In Step Two they answered the comprehension questions over the material. Step Three was to re-read the selection with a set of trying to increase initial speed. Steps Four and Five were identical to those of Groups I and II. The equated reading was completed and the corresponding comprehension questions answered. Vocabulary study was similar to that of the other groups.

Individual records were kept of the rate of projection for Groups I and II and the rate of reading the pamphlets for

* The initial and final rates were identical after a speed of four hundred words per minute had been attained. Higher rates were impossible because of the mechanical limitations of the projector.

Group III, the number right of the film comprehension and equated reading questions, and the rate in words per minute on the equated reading selections. Each subject was given a chart at each class meeting with a complete record of his performance up to that date.

To obtain eye-movement records the subjects read three one-hundred-word selections borrowed from Stone.* His questions were also used. The passages were read in the opthalm-o-graph, once each before training in reading and once each again after training.[4] Only the records of the third one hundred words were used in the study. Seibert[7] and Stone[9] have both shown that the most efficient measures of eye movements in a three-hundred-word passage are to be found in the last one hundred words.

These records were analyzed for the number of fixations and regressions for the third one hundred words (three hundred ems), the span of recognition in ems, and the average duration of fixations in seconds. Regressions were counted as fixations. Average duration of fixations was determined by dividing the total time of reading the third one hundred words of the passage by the total number of fixations. This total time includes besides the time for fixations, the time of eye movements between fixations and the time for the return sweep to the beginning of each line. Tinker[11] has found that this movement accounts for less than ten per cent of the total reading time. In determining average duration of fixations from ophthalm-o-graph records, this movement time was disregarded.

The nine reading subtest scores were obtained from the *Traxler High-school Reading Test,*[12] the *Iowa Silent Reading Test, Advanced,*[2] and the *Blommers Rate of Reading Comprehension Test.*[1]

As noted earlier, the students of six college classes served as subjects. Three methods groups consisting of two classes each were formed. Because of other commitments it was not possible to secure two teachers who could each train three groups. Therefore, Teacher A was assigned three groups; Teacher B, two groups; and Teacher C, one group. Teacher A used methods one, two, and three; Teacher B used methods one and three; Teacher C used method two. Simple analysis of variance was

* Before any records were taken each subject read a selection in the opthalm-o-graph to acquaint himself with the apparatus.[11]

used to determine whether or not there were any significant differences between the three methods as taught by Teacher A.[5] (The gains were used in all analyses.) Methods one and two were repeated once. The data were analyzed by factorial design analysis of variance. In order to correct for disproportionality of the groups, Snedecor's[8] correction for disproportionate subclass numbers was used.

*The Criteria.*—The criteria consisted of fourteen measures: five were ophthalm-o-graph records and nine standardized reading subtest scores.

## RESULTS AND STATISTICAL TREATMENT

In order to determine whether each of the three methods of teaching reading resulted in reliable gains, a *t* test for the difference in the means for related measures was applied. The hypothesis tested is that the gains in each case are zero.

In Table I are recorded the gains for the six experimental groups. It may be seen that the obtained differences for the following criteria are significant at the one per cent level of confidence or better: number of fixations and regressions;* span of recognition; rate of reading gains as determined by the Blommers test, the Iowa test, the Opthalm-o-graph, and the Traxler test; and the gains for rate of comprehension as determined by the Traxler Paragraph Comprehension Test. It is thus possible to reject the null hypothesis at a very high level of confidence as applied to the gains on these subtests.

The gains for the average duration of fixations,** the Iowa Comprehension test, Sentence Meaning test, and Paragraph Comprehension test, and the Traxler Story Comprehension test*** are significant for some groups. In order to determine whether the over-all gain for each of these groups is significant, the chi-square method of combining probabilities was used. Each of the differences was found to be significant at the one per cent level. This indicates that there was a significant over-all gain for the five criteria in question.

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* A reduction in the number of fixations and regressions indicates an improvement.

** A reduction in the average duration of fixations indicates an improvement.

*** The gains for this test were negative, indicating a loss.

While the over-all loss in comprehension on the Traxler Story Comprehension test (Table I) was significant, the subjects made a significant gain on the Comprehension Test of the Iowa Silent Reading test. Since the latter is a timed test, the rate factor enters into the score to an extent. All rate scores in this study showed highly significant gains, therefore, it is understandable why this test should show a significant over-all gain.

Since all but five of the subjects for this experiment were chosen from the lowest quarter on Form A of the Blommers test, a regression effect in what might be called regression gains probably accounted for some of the gains obtained on Form B of the Blommers test, administered after training; and possibly the gains on the other measures, as a result of intercorrelation among the various initial measures.[1,4] For similar groups selected in a similar way, and for similar measures, Hieronymus obtained little evidence of a spread of regression effect to the other measures.[3] A precise correction for the regression effect was not applied in this investigation since it was not the purpose to demonstrate the presence of reading gains, but rather the effect of methods of instruction upon the magnitude of the gains.

Simple analysis of variance was used to determine whether there were any significant differences among the three methods groups as taught by Teacher A. (See Table II.) It was found that only one F, that for Traxler Rate, was significant at the one per cent level. On the basis of this F test, the method differences are significant. The rank order of the three methods, as determined by the mean gains, was Printed Page Method, Experimental Film Method, and the Harvard Film Method, for Teacher A. Teacher B obtained better results with the Harvard Film Method than with the Printed Page Method. We are prevented from making any generalization relative to a best method because of a significant interaction on the Traxler Rate test, as seen when the results of Teachers A and B for these two methods were analyzed by factorial analysis of variance. A significant interaction in this case indicates that there was no one best method for both teachers.

The only other difference that proved to be significant by the simple analysis of variance for the three methods as taught by Teacher A was that for the Iowa Comprehension Test. Here an F ratio significant at the five per cent level of confidence was

TABLE I

| Measures | Harvard Film | | | | Exp. Film | | | | Printed Page | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Group 1 (N = 25) Teacher A | | Group 2 (N = 21) Teacher B | | Group 3 (N = 22) Teacher A | | Group 4 (N = 22) Teacher C | | Group 5 (N = 18) Teacher A | | Group 6 (N = 27) Teacher B | |
| | M | t | M | t | M | t | M | t | M | t | M | t |
| *Reading Rate* | | | | | | | | | | | | |
| Blommers (1) | 19.27* | 12.51 | 16.58* | 7.86 | 17.65* | 11.90 | 13.33* | 7.28 | 15.29* | 6.40 | 11.44* | 7.78 |
| Opthalmograph (2) | 463.80* | 7.52 | 378.43* | 8.36 | 518.73* | 8.95 | 654.68* | 6.08 | 594.22* | 8.11 | 346.22* | 8.96 |
| Iowa Rate (1) | 33.96* | 13.48 | 35.55* | 12.43 | 37.09* | 9.92 | 42.05* | 17.52 | 40.11* | 8.72 | 30.56* | 6.91 |
| Traxler Rate (3) | 149.04* | 7.66 | 143.71* | 6.64 | 166.00* | 9.06 | 143.21* | 8.10 | 256.5* | 7.13 | 110.04* | 7.74 |
| *Rate of Compreh., Iowa* | | | | | | | | | | | | |
| Comprehension (1) | | | | | | | | | | | | |
| Directed Reading (1) | 20.04* | 6.64 | 9.75† | 2.27 | 12.14† | 2.82 | 8.86† | 2.66 | 6.63† | 2.28 | 7.37 | 1.49 |
| Sentence Meaning (1) | 30.72* | 7.90 | 16.35* | 6.99 | 20.73* | 8.67 | 24.09* | 6.11 | 26.63* | 8.43 | 15.11* | 4.87 |
| Paragraph (1) | 18.00* | 5.94 | 14.00* | 6.67 | 17.09* | 5.72 | 5.09 | 1.41 | 16.53* | 6.01 | 11.89* | 3.85 |
| Compreh. | 12.48* | 3.75 | 13.30* | 4.18 | 13.32* | 5.57 | 5.09 | 1.69 | 11.68* | 3.46 | 7.50* | 3.33 |
| *Compreh. Traxler* | | | | | | | | | | | | |
| Story Comprehension (4) | −1.00 | −1.75 | −1.67† | −2.53 | −1.00 | −1.19 | −0.83 | −1.02 | −2.19† | −2.64 | −1.19 | −1.59 |
| Paragraph Comprehension | 6.77* | 7.87 | 5.48* | 7.72 | 5.57* | 4.97 | 3.33* | 3.17 | 3.81* | 5.08 | 3.26* | 4.94 |
| *Eye Movements* | | | | | | | | | | | | |
| Red. in Fix (5) | 28.52* | 8.67 | 33.38* | 10.08 | 37.55* | 9.20 | 34.32* | 12.35 | 33.11* | 8.32 | 25.07* | 8.77 |
| Red. in Reg. (5) | 7.72* | 5.48 | 11.10* | 5.75 | 10.45* | 7.06 | 10.68* | 8.90 | 7.39* | 4.59 | 6.56* | 7.45 |
| Red. span (in ems) | 1.41* | 8.81 | 1.52* | 10.13 | 1.91* | 8.30 | 1.94* | 6.47 | 1.91* | 7.96 | 1.22* | 11.09 |
| Red. of duration of fix (in seconds) | .033* | 3.30 | .000095 | .0095 | .017† | 2.43 | .027* | 3.00 | .031† | 2.58 | .015* | 3.00 |

(1) Standard Score
(2) ems per minute
(3) words per minute
(4) number correct
(5) per 300 ems (100 words)

Level of Confidence
* 1% or better
† 5% or better

M = Mean Gain
t = t ratio

obtained. The rank order in mean gains is as follows: Harvard Film Method, Experimental Film Method, and the Printed Page Method.

Since Teacher A and Teacher B each taught by the Harvard Films Method and the Printed Page Method, it was possible to consider the data from the point of view of a factorial design in

TABLE II.—SIMPLE ANALYSIS OF VARIANCE

| Test Measures | F | P |
|---|---|---|
| Number of fixations per 300 ems* | 1.548 | N.S. |
| Number of regressions per 300 ems | 1.272 | N.S. |
| Span of recognition in ems | 1.95 | N.S. |
| Average duration of fixations in seconds | 0.795 | N.S. |
| Rate in ems per minute** | 1.007 | N.S. |
| Blommers Rate of Comprehension Score | 1.204 | N.S. |
| Traxler High-school Reading Test, Rate in words per minute | 5.24 | 1%† |
| Traxler High-school Reading Test. Story Comprehension | 0.806 | N.S. |
| Traxler High-school Reading Test, Paragraph Comprehension | 2.508 | N.S. |
| Iowa Silent Reading Test, Rate Score | 0.753 | N.S. |
| Iowa Silent Reading Test, Comprehension Score | 3.714 | 5%†† |
| Iowa Silent Reading Test, Directed Reading Score | 2.453 | N.S. |
| Iowa Silent Reading Test, Sentence Meaning Score | 0.073 | N.S. |
| Iowa Silent Reading Test, Paragraph Comprehension | 0.065 | N.S. |

* One word is equal to three ems.
** As measured by the Ophthalm-o-graph.
† Favors the Printed Page Method.
†† Favors the Harvard Film Method.

which teachers and methods become the factors. (See Table III.) Since the subgroups were disproportional in size, the correction described by Snedecor was applied before the analysis of variance was carried out.[8] In order to determine whether the difference between the two methods varied significantly from teacher to teacher, the interaction variance was compared with the within

TABLE III.—FACTORIAL ANALYSIS OF VARIANCE

| Test Measures | F Interaction | P | F Method | P | F Teacher | P |
|---|---|---|---|---|---|---|
| Number of fixations per 300 ems[1] | 3.706 | NS | 0.737 | NS | 0.452 | NS |
| Number of regressions per 300 ems | 2.092 | NS | 5.409 | 5%* | 3.109 | NS |
| Span of recognition in ems | 5.960 | 5% | .036 | NS*** | .478 | NS*** |
| Average duration of fixations in seconds | 0.000 | NS | 0.932 | NS | 7.618 | 1%** |
| Rate in ems per minute[2] | 2.189 | NS | 0.649 | NS | 8.957 | 1%** |
| Blommers Rate of Comprehension Score | 0.098 | NS | 8.830 | 1%* | 6.005 | 5%** |
| Traxler High-school Reading Test, Rate in words per minute | 9.724 | 1% | .250 | NS*** | 1.145 | NS*** |
| Traxler High-school Reading Test, Story Comprehension | 1.387 | NS | 0.452 | NS | 0.241 | NS |
| Traxler High-school Reading Test, Paragraph Comprehension | 0.237 | NS | 11.61 | 1%* | 21.63 | 1%** |
| Iowa Silent Reading Test, Rate Score | 2.157 | NS | 0.007 | NS | 1.004 | NS |
| Iowa Silent Reading Test, Comprehension Score | 1.806 | NS | 5.753 | 5%* | 3.545 | 5%** |
| Iowa Silent Reading Test, Directed Reading Score | 0.185 | NS | 0.626 | NS | 15.232 | .1%** |
| Iowa Silent Reading Test, Sentence Meaning Score | 0.012 | NS | 0.381 | NS | 2.209 | NS |
| Iowa Silent Reading Test, Paragraph Comprehension | 0.671 | NS | 2.110 | NS | 1.210 | NS |

[1] One word is equal to three ems.

[2] As measured by the Ophthalm-o-graph.

* Favors the Harvard Film Method.

** Favors Teacher A.

*** Interaction variance was used here for the error term.

subgroups variance by means of the F test for each criterion. The F for the Traxler Rate test was significant at the one per cent level, and the F for the span of recognition was significant at the five per cent level of confidence. A significant interaction F indicates here that there is no one best method for both teachers as measured by these two criteria.

On the remaining criteria an F test for the significance of the

difference between the means for teachers and the means for methods was applied. Differences on the Blommers test and the Traxler Paragraph Comprehension test favor the Harvard Films Method over the Printed Page Method. These differences are significant at the one per cent level of confidence. The methods differences as measured by the Iowa Comprehension test and the reduction in the number of regressions are significant at the five per cent level of confidence. These differences also favor the Harvard Films Method.

Of the four measures of rate of reading used in this investigation only one, the Blommers Rate of Comprehension test, showed a significant difference between training methods. This difference favors the Harvard Films over the Printed Page. The design of this test is such as to suggest that it measures 'rate of comprehension.' The Traxler Paragraph Comprehension test and the Iowa Comprehension test, both of which may be regarded as rate of comprehension tests, showed method differences** favoring the Harvard Films. However, the Iowa Sentence Meaning and Paragraph Comprehension tests, which ostensibly should measure rate of comprehension also, did not show any significant methods differences. To the foregoing may be added the fact that the Harvard Film method proved to be superior, significant at the five per cent level, to the Printed Page method in reduction of regressive movements.

Out of the fourteen criteria used in this study, four yielded significant differences between methods, the differences favoring the Harvard Film method. Despite the lack of any more clearly defined advantage in favor of the films, both Teacher A and Teacher B reported a greater enthusiasm and a more coöperative spirit on the part of those students who were trained with the films. The instructors used in this study were highly trained and well qualified for this type of program. The fact that they found it more difficult to motivate students without the films would lead one to believe that with untrained and less well qualified teachers a more uniform advantage in favor of the film would be found.

Relative to the two kinds of films used in this experiment, it should be emphasized that when the methods employing these

** This difference was significant at the five per cent level of confidence.

films as taught by Teacher A were compared, no conclusive evidence was found which would tend to prove either method the better. From the reports of the subjects trained with the Harvard Films a number indicated that the short exposure of the phrased material caused considerable eye strain. There was no criticism of the experimental films.

From an inspection of the mean gains for the various criteria and also from the fact that there were six significant teacher differences all favoring Teacher A, it appears that Teacher A was in general obtaining much higher mean gains than Teacher B. It is at least interesting to have solid evidence that teachers make a difference. There was no general trend favoring any one method when the results of the three groups taught by Teacher A were analyzed. However, when the results of Teachers A and B were combined in the factorial analysis of variance there was a trend favoring the Harvard Films. Other data emphasizing the fact that methods differ from teacher to teacher, were the significant interaction F ratios for the Traxler Rate test and the span of recognition, an eye-movement measure. In addition, from the inspection of the mean gains, we find five other criteria where there is a tendency for effectiveness of methods to differ from teacher to teacher.

## CONCLUSIONS

The data appear to justify the following conclusions, subject to the conditions of this investigation.

1) Eye movements, including number of fixations and regressions and span of recognition, improved substantially under the three instructional methods used in this experiment. There was also a significant over-all reduction in the average duration of fixations.

2) Reading rate as measured by the Traxler High-school Reading Test, the Ophthalm-o-graph, the Iowa Silent Reading Test, and the Blommers Rate of Comprehension Test showed a large improvement with these same three instructional methods.

3) Rate of Comprehension as measured by Part II of the Traxler High-school Reading Test* and the Iowa Silent Reading Tests, showed significant over-all improvement.

* In this study a time limit of fifteen minutes was set for the administration of this test.

4) Comprehension as measured by the Story Comprehension Test of the Traxler High-school Reading Test showed over-all losses per reading when there was a large mean gain in reading rate. There was, however, a decided gain in comprehension per unit of time.

5) This study does not give evidence that techniques designed specifically to train eye movements are generally more effective than the other methods employed. However, by certain criteria, controlled eye-movement practice did prove to be a superior method of training in rate of reading comprehension. There were no significant differences between the methods used for improving rate when no level of comprehension was set for the reader.

6) The efficiency of the method varied with the criterion and teacher used. No single method was best for all teachers.

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# AN INVESTIGATION OF SOME OF THE FACTORS RELATED TO SUCCESS OR FAILURE OF SCHOOL OF COMMERCE STUDENTS

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Even the most cursory scanning of pedagogical and psychological literature reveals a steadily growing awareness on the part of the various interested professions that an unwarranted number of young men and women enter college without the necessary capacities and qualities—whatever their nature may be—to complete academic work or to benefit from the time, effort, and money spent in such an undertaking. Since the late thirties, and especially in the postwar years, educators have become increasingly concerned with the problems of selection of students and prediction of success in academic endeavors. A goodly number of reports have been published discussing these problems and proposing selective and predictive devices for adequate screening and prediction of success.

The most impressive and probably most meaningful data, published by Munroe,[4] have been widely discussed in educational circles. There would be little justification in repeating work such as she has done, and to pile another report upon the already existing literature, were it not for one methodological flaw in her study, and in most similar studies, which appears rather significant to the authors of this report. Munroe's study, as well as most other studies of like nature, attempts to evaluate the soundness of the predictive techniques by comparing them with scholastic achievements of the students in question at the end of the freshman year. Yet it seems rather obvious that for a goodly number of students freshman grades are not valid indices of future performance. Virtually any educator or educational psychologist is aware that a number of unpredictable circumstances may lead to quite marked changes in a student's grades from one year to another, and that when a student is making the difficult

* This article summarizes the results of a study which was conducted at the School of Commerce, Accounts, and Finance, New York University under the general direction of N. L. Hoopingarner, Professor of Business Psychology.

transition from high school to college work, his freshman grades are often no dependable predictor of future achievement. With these considerations in mind, the authors undertook to make a comparative investigation of consistently 'failing' and consistently 'successful' college students.

## THE PROBLEM

The purpose of this study was to discover whether it is possible to differentiate between two groups of upper-classmen in a school of commerce showing marked differences in scholastic success over a three- or four-year period, and thereby to be able to draw some inferences as to what is good or poor student material.

## PROCEDURE

Two groups of students, all upperclassmen, were subjected to a battery of group and individual psychological tests. Group A consisted of very superior students who had continuously maintained excellent academic records, being dean's list, scholarship, and honor students. Group B consisted of students who had been frequently on probation and had each been warned several times of the probability of being prohibited from continuing attendance at school unless marked improvement should be shown in grades. Somehow these students managed to remain in school, and eventually reached junior and senior years. Both groups were drawn from the student population at a school of commerce in such a manner as to prevent the investigators from being aware whether any individual subject was a member of Group A or Group B. Hereafter, Group A will be referred to as the 'Successful' group, and Group B as the 'Non-successful' group. At the completion of the study there remained fifteen subjects in the successful group and thirteen in the non-successful group, that is, this number of students had taken all the tests in the battery.

Statistical treatments suitable for comparison of the groups were applied to the data obtained from administration of the several tests.

## ASSUMPTIONS

It was assumed that over a period of three or four years chance factors would cancel out, making the groups comparable on the

basis of achievement and factors related to achievement. It was further assumed that over such a period of time intellectual functions would not have undergone any appreciable changes. The authors recognize the difficulties involved in estimating intellectual function on basis of test performance, but allowances were made for this in considering the data. The emotional factors involved had to be evaluated at the time of examination, and it can not be assumed that personality factors were identical throughout the three- or four-year period. However, in view of continuing failure or continuing success of the subjects of this study, the authors feel justified in assuming that the basic personality structures showed little change from the time each of the students had begun his college career. This is a debatable assumption; however, it seems to be just as valid or invalid as an assumption that personality patterns existent at the time of entrance into college will remain constant until graduation.

The following tools were employed in the evaluation procedure, and so far as it was possible were administered, scored, and interpreted in accordance with the sources of suggestions and directions indicated in the bibliographic references:

1) A standardized interview designed to reveal information on study habits, extra-curricular activities, attitudes, and other factors possibly related to scholastic achievement.

2) American Council on Education Psychological Examination, 1945 College Edition.[7]

3) Minnesota Multiphasic Personality Inventory, group form.[1,2]

4) Wechsler-Bellevue Test of Intelligence, Form I.[5,9]

5) Rorschach test.[3,4,5]

6) Autokinetic test.[6,8]

In view of the fact that the difficulty of obtaining subjects meeting the rigid criteria of success or failure, who also were able to devote the amount of time necessary for participation in the intensive study, necessarily limited the size of the experimental sample, the data were treated with caution and are presented here as those of an exploratory, rather than a definitive, study.

## RESULTS

Mean scores for both groups were computed for the several tests administered. The mean scores for the Wechsler-Bellevue

Test, the A.C.E. Psychological Examination, and the Minnesota Multiphasic Personality Inventory are presented in Tables I, II, and III, respectively. In addition, the mean scores—in terms of greatest distance traversed from the center—were computed for the test of the autokinetic effect, and were found to be 8.6 and 12.6 inches for the Successful and Non-successful group, respectively.

TABLE I.—MEAN IQ. SCORES ON THE WECHSLER-BELLEVUE TEST FOR BOTH GROUPS

| Group | Full Scale | Verbal Scale | Performance Scale |
|---|---|---|---|
| Successful | 123.0 | 124.2 | 117.5 |
| Non-successful | 111.7 | 114.5 | 104.5 |

TABLE II.—MEAN PERCENTILE SCORES ON THE A.C.E. EXAMINATION FOR BOTH GROUPS

| Group | Total Test | Q Scale | L Scale |
|---|---|---|---|
| Successful | 85.5 | 77.1 | 87.7 |
| Non-successful | 49.7 | 43.9 | 56.7 |

TABLE III.—MEAN T SCORES ON THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY FOR BOTH GROUPS

| Group | Scale | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Hs | D | Hy | Pd | Mf | Pa | Pt | Sc | Ma |
| Successful | 51.8 | 54.2 | 57.1 | 51.2 | 60.2 | 49.3 | 51.2 | 49.4 | 51.9 |
| Non-successful | 53.3 | 53.5 | 57.0 | 54.4 | 61.3 | 53.2 | 54.9 | 57.7 | 58.4 |

Results of the Rorschach test, which do not lend themselves readily to statistical combinations or analyses, were treated by making a judgement of whether the record of each individual was indicative of good personal and social adjustment. These judgements were based upon the generally accepted criteria of adjustment, such as M:C balance, sum of C responses, W:M balance, apperceptive tendency, quality of responses, and the several other criteria which enter into the interpretation of a

TABLE IV.—JUDGMENTS OF ADJUSTMENT OF BOTH GROUPS ON THE BASIS OF THE RORSCHACH TEST

| Group | Number Judged Adequate Adjustment | Number Judged Inadequate Adjustment | Total |
|---|---|---|---|
| Successful | 7 | 8 | 15 |
| Non-successful | 5 | 8 | 13 |
| Total | 12 | 16 | 28 |

Rorschach record. Table IV indicates the numbers of records diagnosed 'adequately adjusted' and 'inadequately adjusted' in each group.

Of the many factors available from the standardized interview, three were selected for consideration on the bases of probable relation with academic success and the ease with which the data could be expressed quantitatively. These factors were: chronological age, hours spent weekly in gainful occupation outside of school, and hours spent weekly in study of course material. The means for both groups on each of these factors are presented in Table V.

TABLE V.—MEANS OF CHRONOLOGICAL AGE, HOURS OF WORK PER WEEK, AND HOURS OF STUDY PER WEEK FOR BOTH GROUPS

| Group | Age | Hrs. Work/wk. | Hrs. Study/wk. |
|---|---|---|---|
| Successful | 22.9 | 10.1 | 14.4 |
| Non-successful | 20.8 | 8.1 | 10.4 |

Accepting a probability level of one per cent as indicating that a difference is not attributable to chance factors alone, it may be seen (Table VI) that the differences in means of both groups is

TABLE VI.—SIGNIFICANCE OF DIFFERENCES IN MEANS OF BOTH GROUPS ON THE WECHSLER-BELLEVUE TEST*

| | Difference | *t* |
|---|---|---|
| Full Scale | 11.3 | 3.751 |
| Verbal Scale | 9.7 | 3.075 |
| Performance Scale | 13.0 | 4.310 |

* degrees of freedom = 26; *t* at one per cent level = 2.779.

significant on both scales of the Wechsler-Bellevue test and on the total test. The *t* ratios obtained indicate that the chances are at least ninety-nine in one hundred that the differences between means of the two groups may not be accounted for by the operation of chance factors alone. Similarly, in consulting Table VII it may be seen that significant differences between means

TABLE VII.—SIGNIFICANCE OF DIFFERENCES IN MEANS OF BOTH GROUPS ON THE A.C.E. EXAMINATION*

| | Difference | *t* |
|---|---|---|
| Total Test | 35.8 | 4.041 |
| Q Scale | 33.2 | 3.362 |
| L Scale | 31.0 | 4.276 |

*degrees of freedom = 27; *t* at one per cent level = 2.771.

of the two groups were found on both sub-scales and on the total A.C.E. examination.

Reference to Table VIII will indicate that with only one ex-

TABLE VIII.—SIGNIFICANCE OF DIFFERENCES IN MEANS OF BOTH GROUPS ON THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY*

| Scale | Difference | *t* |
|---|---|---|
| Hs | 1.5 | 0.449 |
| D | 0.7 | 0.188 |
| Hy | 0.1 | 0.037 |
| Pd | 3.2 | 0.936 |
| Mf | 1.1 | 0.320 |
| Pa | 3.9 | 1.43 |
| Pt | 3.7 | 1.365 |
| Sc | 8.3 | 3.799 |
| Ma | 6.5 | 1.509 |

* degrees of freedom = 24; *t* at one per cent level = 3.745.

ception the differences in means of the two groups on the scales of the Minnesota Multiphasic Personality Inventory are not significant. Only on the $S_c$ (schizophrenia) scale is there a difference in means which yields a *t* ratio reflecting significance; operation of chance factors alone could have accounted for the Non-successful

group obtaining a mean $S_e$ score 8.3 higher than that of the Successful group less than one time in one thousand.

The *t* ratios for differences between means of the M.M.P.I. scales for the Successful group are given in Table IX, and those for the Non-successful group are given in Table X. It will be

TABLE IX.—MATRIX OF *t* RATIOS FOR DIFFERENCES BETWEEN MEANS ON SCALES OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY FOR THE SUCCESSFUL GROUP

(degrees of freedom = 25; *t* at one per cent level = 2.787)

| | Hs | D | Hy | Pd | Mf | Pa | Pt | Sc |
|---|---|---|---|---|---|---|---|---|
| D | 0.733 | | | | | | | |
| Hy | 2.021 | 0.981 | | | | | | |
| Pd | 0.193 | 0.900 | 2.133 | | | | | |
| Mf | 3.017* | 1.935 | 1.292 | 3.082* | | | | |
| Pa | 0.970 | 1.681 | 3.617* | 0.698 | 4.636* | | | |
| Pt | 0.199 | 0.910 | 2.232 | 0.000 | 3.204* | 0.730 | | |
| Sc | 0.954 | 1.677 | 2.705 | 0.675 | 4.726* | 0.044 | 0.708 | |
| Ma | 0.026 | 0.684 | 1.901 | 0.219 | 2.870* | 0.966 | 0.226 | 0.948 |

* significant at the one per cent level or less.

TABLE X.—MATRIX OF *t* RATIOS FOR DIFFERENCES BETWEEN MEANS ON SCALES OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY FOR THE NON-SUCCESSFUL GROUP

(degrees of freedom = 23; *t* at one per cent level = 2.807)

| | Scale | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Hs | D | Hy | Pd | Mf | Pa | Pt | Sc |
| D | 0.057 | | | | | | | |
| Hy | 1.183 | 0.974 | | | | | | |
| Pd | 0.330 | 0.239 | 0.758 | | | | | |
| Mf | 2.179 | 1.640 | 1.144 | 1.754 | | | | |
| Pa | 0.031 | 0.082 | 1.155 | 0.344 | 2.122 | | | |
| Pt | 0.598 | 0.437 | 0.751 | 0.154 | 1.886 | 0.592 | | |
| Sc | 1.162 | 1.292 | 0.246 | 0.888 | 1.048 | 1.541 | 1.197 | |
| Ma | 1.177 | 1.047 | 0.317 | 0.878 | 0.603 | 1.167 | 1.129 | 0.223 |

seen that for the latter group there are only two ratios which seem to be suggestive of a tendency toward a significant difference in means: between $M_f$ (masculinity-femininity) and $H_s$ (hysteria), and between $M_f$ and $P_a$ (paranoia). In both of these cases the $M_f$ score is the higher. For the Successful group there are several significant differences in mean scores on the scales: between $M_f$ and $H_s$, $M_f$ and $P_a$, $M_f$ and $P_d$ (psychopathic deviate), $M_f$ and $P_t$ (psychasthenia), $M_f$ and $S_c$, and $M_f$ and $M_a$ (hypomania); in each of these the $M_f$ score is the higher. Also the difference in mean scores on the $P_a$ and $H_y$ (hypochondriasis) scales is significant, with the mean score on the $H_y$ scale the higher.

The difference in means of 4.0 inches on the test of the autokinetic effect yielded a *t* ratio of 2.857; this indicates a significance between the 1 per cent and 0.1 per cent levels. The biserial correlation between greatest expanse on the autokinetic test and academic success and non-success yields a coefficient of correlation of 0.86.

Correlation of Rorschach records judged 'adequate adjustment' and 'inadequate adjustment' with academic success and non-success yields a Phi coefficient of 0.083. The biserial correlation of 'adequate' and 'inadequate' adjustment Rorschach records with greatest expanse on the autokinetic test yields a coefficient of correlation of 0.26.

Two of the three means obtained from the interview data did not yield *t* ratios which suggest significant differences between the groups; however a difference in mean age of the groups—with the mean age of the Successful group being greater by 2.1 years—yields a *t* ratio of 3.440, significant at the one per cent level of probability.

## DISCUSSION AND INTERPRETATION

There can be little doubt that actual differences exist between the groups. Since intelligence plays so great a part in academic success, it is to be expected that the Successful group should exceed the Non-successful group on all scales of the Wechsler-Bellevue test and on the A.C.E. Psychological Examination. So far as the other statistically significant differences between the groups are concerned, the relationship between academic success and test performance is not so obvious.

Although no mean score for either group is at the 70 *T* level on M.M.P.I. scales, both groups slightly exceed one standard deviation from the norm mean on the $M_f$ scale. This indicates that there is a decided tendency for these students, regardless of academic success, to have interests similar to those of the opposite sex. Since all the students in this study had completed at least two academic years in the school of commerce, it is impossible to determine whether such interest is the result of environmental influences in the school of commerce, or whether such interests comprise a factor influencing curriculum selection. The fact that the $M_f$ score of the Successful group is significantly greater than the mean scores on several other scales of the M.M.P.I. would cause a suspicion that interests similar to those of the opposite sex is a characteristic feature of these commerce students. A similar tendency for the Non-successful group seems to give added strength to this suspicion.

As mentioned above, the Non-successful group significantly exceeds the other group on the $S_e$ scale of the M.M.P.I.; the mean score of the Successful group is very close to the norm mean, while that of the Non-successful group is nearly one standard deviation from the norm mean. Again, it is virtually impossible to infer the causal or sequential relationship; either schizophrenic-like tendencies contribute to academic failure, or continued failure is a contributing factor in the development of schizophrenic-like tendencies.

Performance on the autokinetic test quite definitely seems to be related to academic success of commerce students. Both the correlation with success and the difference in means of the groups are significant. Since there is no obvious relationship between scholastic achievement and expansiveness in an ambiguously structured perceptual situation, it may most safely be assumed at the present time that there is some relationship between the factors influencing performance on the autokinetic test and the factors involved in academic success. In any case, the autokinetic test seems to hold sufficient promise as a diagnostic and predictive tool to warrant further investigation.

On the face of it, the Rorschach test does not seem to differentiate the groups. This, however, is attributable to the method by which the Rorschach results were treated, and not to an inherent unsuitability of the test as a predictive device. It is

fairly obvious that, although some forms of inadequate adjustment in personal and social spheres may be severe handicaps in academic work, still other forms of maladjustment may contribute materially to scholastic success. And Rorschach records interpreted individually with this in mind actually had a high predictive value, as contrasted with the results obtained when records were classified into 'adequate' or 'inadequate' adjustment for the purpose of grouping the data.

On the basis of the interview data, it is apparently justifiable to conclude that neither the press of extra-curricular duties nor the amount of studying done is a differentiating factor in academic success. Although studying is recognizedly important for scholastic achievement, the amount of time spent on it is apparently not so important as the efficiency with which it is done. Although the Successful group was significantly greater in age than the Non-successful group, it does not seem safe to conclude that age alone is an important factor in academic achievement; it seems more likely that age reflects other factors related to success, such as motivation and relative preparedness for the curricula.

## SUMMARY AND CONCLUSIONS

Two selected groups of upper-classmen in a school of commerce, differing markedly in scholastic success, were evaluated by means of a battery of psychological tests. It was found that the two groups were readily differentiated when qualitative as well as quantitative measures were considered, and that there were some features characteristic of the commerce students regardless of level of achievement.

On a group basis, individual and group intellectual measures differentiate between the superior and inferior groups adequately. However, the overlap of intellectual level precluded the possibility of individual prediction, and only measures of personality adjustment, qualitatively treated, could account for the fact that students of high intelligence fail consistently and that students relatively low in intelligence achieve high academic success.

Since there is no readily apparent reason for some of the differences observed, further study is indicated to determine the nature of the relationships between academic success and certain personality characteristics, as well as to determine whether similar differences might be found in other college groups.

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# AN ANALYSIS OF GEOMETRIC ABILITY*

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## INTRODUCTION

Never before in the history of mental testing has such a demand for vocational guidance and aptitude testing come into the foreground as in the present era. The needs of the day press for predictions of future success in a vast number of fields of endeavor. Business requires proper and rapid methods for the selection and training of personnel, overcrowded schools search for tools to place students in their proper field. One answer obviously is aptitude testing. As for the effectiveness with which aptitude tests serve their purpose, we must inquire into how they were constructed and analyze the traits which the tests claim to measure.

The objective of the present study was to determine the relative contributions of certain primary abilities to achievement in a specific area of educational content, *viz.* geometry. In view of the factors already established by Thurstone,[3] it was believed that the most fruitful factors to investigate in this connection are reasoning, spatial relations, verbal, and numerical aptitudes.

Holzinger and Swineford[1] undertook to discover the predictive value of the spatial and general deductive factors in forecasting the achievement of high-school students in plane geometry. A bi-factor analysis of the intercorrelations of the tests was made to verify the test grouping found in previous studies and to furnish the necessary statistics for the estimation of the two orthogonal factors: deductive ability and spatial ability. From their results, they found that spatial ability correlates with geometry as measured by teachers' grades only to the extent of .23, while its correlation with shop work is .46 and with drawing .69. They also found that the deductive factor correlated with geometry grades to the extent of .584 and that it was a better predictor of geometry than is the space factor.

* This report comprises a summary of an M. A. research conducted under the supervision of Prof. Anne Anastasi of Fordham University. The author is also indebted to J. Gibbons for his invaluable assistance in administering the tests and preparing the manuscript.

In another study, Washburn[4] made an investigation of the relationship of ability in mathematics to reasoning and academic standing. The conclusions drawn were as follows: (1) mathematical ability and reasoning ability are related and good reasoning guarantees good mathematical ability; (2) mathematical ability may exist without good reasoning ability, and with low academic standing.

## PROCEDURE

*Subjects.*—Geometric ability in this study was measured by a short-range achievement test and by terminal grades at the completion of the first semester. To meet the first requirement, a Geometry Test was constructed and standardized on the sampling employed in the present investigation. The subjects consisted of three hundred forty-seven boys, all of whom were students in ten first-year geometry classes in three different high schools in New York City. For the analysis of geometric ability, the only subjects retained were those on whom a complete set of scores was available. Since the tests had to be administered on different days, subjects who had been absent from any of the tests had to be discarded. Thus the final sample included two hundred fifty-five subjects from the original group. The representativeness of the sample was taken into account by a consideration of the age factor as well as the socio-economic status of the subjects. The latter was determined from fathers' occupation and the extent of the father's education.

*Materials.*—The items of the Geometry Test were of varied structure, including true-false, multiple-choice, completion, and geometric proofs. The test showed a reliability coefficient of .92 by the Kuder-Richardson technique and a validity coefficient of .61 when correlated with the outside criterion of teachers' terminal grades. The individual items were subjected to a test for internal consistency by the use of phi coefficients. For a complete description of the test and the standardization sample, the reader is referred to the original study.[2]

Other functions in the analysis of geometric ability were measured by current standardized tests. Most available tests of reasoning were inapplicable to the study either because of their brevity (most of them constituting only short subtests of a battery), or because their level of difficulty was not suited to the

population under investigation. In meeting these difficulties, the Reasoning Test of the *Chicago Primary Mental Ability* battery proved to be the most satisfactory. As for the measurement of spatial relations, the most suitable test seemed to be the *Minnesota Paper Form Board.* The *Modified Alpha Examination Form 9* was chosen primarily so that numerical and verbal scores could be obtained. The terminal grades which served as one of the two indices of achievement in geometry were obtained from teachers at the end of the first semester and were expressed on a percentage basis.

*Statistical Treatment.*—The first step was the calculation of all the intercorrelations among scores from the following seven variables: terminal grades, spatial relations, reasoning, alpha numerical, alpha verbal, geometry test and the age factor. All the correlations were computed by the Pearson product-moment formula and each is based on the scores of two hundred fifty-five subjects. The twenty-one correlations between the variables listed are given in Table I.

From an application of the tests of significance, it is practically certain that all the correlations with the age factor are close to zero. All the other correlations are significantly greater than zero with the exception of the correlation between the numerical

TABLE I.—CORRELATIONS AMONG ALL VARIABLES

| Variable | Terminal Grades | Spatial Relations | Reasoning | Alpha N | Alpha V | Geometry Test |
|---|---|---|---|---|---|---|
| Terminal Grades | | | | | | |
| Spatial Relations | .271 | | | | | |
| Reasoning | .292 | .240 | | | | |
| Alpha N | .364 | .149 | .475 | | | |
| Alpha V | .290 | .251 | .541 | .426 | | |
| Geometry Test | .608 | .283 | .378 | .370 | .430 | |
| Age | .062 | .094 | −.092 | −.084 | −.041 | .023 |

and spatial tests, which is not significant at the .01 level but significant at the .05 level.

*Multiple Correlations.*—Two multiple correlation coefficients have been calculated from the correlation coefficients given in Table I—one between the terminal grades and scores on the reasoning, spatial, verbal, and numerical aptitudes on the one hand, and the other between scores on the Geometry Test and

the same aptitude tests. By the use of the Doolittle method, the multiple correlation coefficients were found to be .442 and .515, respectively.

## INTERPRETATION AND DISCUSSION

*Intertest Correlations.*—In contrasting the contributions of spatial relations and the numerical factor to the two criteria, namely, terminal grades and scores on the Geometry Test, the numerical factor is consistently higher. Each factor, however, contributes approximately the same amount to both criteria, although spatial relations is the lowest contributing factor to either criterion. In the case of the verbal and reasoning factors, both contribute more to the score on the Geometry Test than they do to the terminal grades.

Although not related to our main problem, it is interesting to note the high degree of the reasoning factor in both the numerical and verbal tests as shown by the correlations of .48 and .54, respectively. Spatial relations, on the other hand, has a much lower correlation with verbal and numerical aptitudes, with an unexpectedly low value of .15 with the numerical factor.

*Coefficients of Determination.*—We can now determine from the correlations between the two criteria and the other variables, what parts of the variance in the criteria is associated with or dependent upon the variance in each of the variables. This can be obtained from the coefficient of determination ($r^2$). From these coefficients, the following conclusions are evident:

1) variance in the spatial relations factor accounts for the smallest amount of the variance in both the terminal grades and the Geometry Test scores.

2) variance in the reasoning factor accounts for a greater amount of the variance in the Geometry Test scores than it does in the terminal grades.

It is interesting to note that when terminal grades are used as a criterion for success in geometry, the correlations of the variables with the criterion show that the contributions of spatial relations, reasoning, and verbal ability are closely similar. The numerical factor, on the other hand, shows a relatively higher contribution to the terminal grades. When the Geometry Test is used as criterion, we find the results to be quite different. We now see that the verbal factor has the highest contributing value

to geometry and that reasoning and the numerical factor are close in agreement. The reasoning factor, however, plays a more important part in the Geometry Test than it does in the terminal grades. Spatial relations has the lowest coefficient of determination with the Geometry Test scores as well as with the terminal grades. From these results, it is obvious that the contributions of the variables vary with the criterion. Terminal grades, for example, depend mainly on teachers' examinations, which in this study are probably highly loaded with problems of a numerical nature. In the Geometry Test, the greatest emphasis is placed on the verbal factor, as shown by a correlation coefficient of .430 between the two variables. This is to be expected in view of the somewhat verbal nature of the Geometry Test.

*Coefficients of Net Determination.*—The proportion of the variance of the criteria attributable to the joint action of all the variables is expressed by the square of the multiple correlation coefficient ($R^2$). For the terminal grades, it was found that twenty per cent of whatever makes students differ in geometry grades is attributable to differences in verbal, numerical, reasoning, and spatial aptitudes. From the components of this coefficient, we know that five per cent is the net contribution of spatial relations to the variance of terminal grades, two per cent is the contribution of the reasoning factor, ten per cent is the contribution of the numerical factor, and three per cent of the verbal factor.

Similarly, with the Geometry Test as the criterion, a twenty-seven per cent contribution of the variables can be broken down into a five per cent net contribution of spatial relations, four per cent contribution of the reasoning factor, seven per cent contribution of the numerical factor, and eleven per cent contribution of the verbal factor.

*Analysis of Results.*—In the present study, the relative contributions of spatial relations, reasoning, numerical and verbal aptitudes to geometric achievement have been determined from two measures: (1) coefficients of determination, and (2) coefficients of net determination. In the first approach, the coefficients of determination ($r^2$) give the total contribution of each test as a whole to performance in geometry. By this method, the percentage of the variance of each criterion accounted for by each test was found to be as follows:

| Test | Geometry Test | Terminal Grades |
|---|---|---|
| Spatial relations | .08 | .07 |
| Reasoning | .14 | .08 |
| Alpha numerical | .14 | .13 |
| Alpha verbal | .18 | .08 |

The coefficients of net determination ($\beta r$), on the other hand, give the contributions of whatever is specific in each test to performance in geometry. By this method, the percentage of variance of each criterion accounted for by what is specific in each test is:

| Test | Geometry Test | Terminal Grades |
|---|---|---|
| Spatial relations | .05 | .05 |
| Reasoning | .04 | .02 |
| Alpha numerical | .07 | .10 |
| Alpha verbal | .11 | .03 |

In the coefficients of net determination, the common contribution made by the tests in this battery is eliminated. The contribution of some tests drops more than others since they apparently share more with other tests in the battery. The relative contribution of what is specific to the four tests follows the same order as that obtained when the total contribution of each test was considered. In the terminal grades, the numerical factor makes the largest contribution, while in the Geometry Test the verbal factor makes the largest contribution.

The remaining variance in both criteria must be attributed to factors not measured in the problem. The writer suggests such factors as interest in school work and other emotional factors, health, amount of distraction in outside activity, as well as other aptitudes not measured in this battery.

## CONCLUSION

These findings suggest the complexity of such an ability as geometric achievement, and the importance of work methods which may not be apparent from a casual observation of the task. Problems whose content seems to involve spatial and reasoning ability may actually be solved by the subject in terms of verbal and numerical techniques.

From a superficial examination of geometric achievement, it is a popular notion that spatial relations plays the predominant rôle in such achievement. The results of this study, however, lend no evidence to support this idea. Probably ability in spatial relations plays a more important rôle in practical situations such as skilled shop work and drawing, rather than in the theoretical aspects of geometry.

The reasoning test also makes a rather low contribution relative to that of the verbal and numerical tests in view of superficial expectation. The results show that the principal difference between the Geometry Test and the terminal grades is the relatively large verbal factor in the test, and the relatively large numerical factor in the terminal grades. This is to be expected in view of the verbal nature of the test and the computational nature of teachers' examinations.

Only further research can give more conclusive evidence as to the nature of geometric ability, the type of reasoning employed in its application, and the contributions of its components.

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# BOOK REVIEWS

HAROLD ERNEST BURTT, *Applied Psychology*. New York: Prentice Hall, Inc., 1948, pp. 821.

There are certain inherent difficulties in the writing of a general book in an applied field. When a writer can deal with the strictly scientific and academic aspects of a subject, a degree of coherence is possible which cannot be attained once one steps outside such clearly defined borders. Particularly is this true in the field of psychology at the present time. This is in part due to the fact that the ramifications of psychological applications have been especially diverse during the past two decades, with still no clearly defined limits in sight. In part, it is due to the difficulty in organizing the treatment of diverse applications which by necessity overlap a great deal in the parts of the basic science which they use.

The over-all organization of Professor's Burtt's book shows four main classifications of material. In his first three chapters he lays a foundation for the special treatments to follow. His introductory chapter gives a brief but clear over-view of the main developments in the field of psychology since the beginning of World War I. This is followed by a chapter on some fundamentals of psychology which will be of more use to beginning students than to laymen. A third chapter gives an excellent debunking of common pseudo-psychological beliefs. This chapter will be of particular interest and value to the lay reader.

The main portion of the book gives a more or less systematic treatment of the major aspects of applied psychology. Three chapters are given to what is usually classified as educational psychology. Two chapters deal with personal efficiency and guidance, topics which are also common to educational treatments but are equally appropriate to applications in some other fields. Medicine and psychiatry come in for the next treatment, three chapters being given them. Problems of the courts and crime are dealt with in four chapters of unusual merit. Industrial and business applications receive the most detailed treatment, ten chapters being devoted to various aspects such as selection and management of employees, industrial efficiency, fatigue and accidents, morale, and problems of advertising. This

section of the book is particularly well done and will be valuable both for general orientation and for special reference.

Following the systematic treatment of the five fields of application mentioned in the foregoing paragraph, Burtt lumps together a group of other applications for superficial treatment in a single chapter. The list of subjects included is rather long, and includes topics such as the psychology of art, music, literature, public speaking, radio and movies, public opinion, politics, religion, war and peace. In some of these fields there are sufficient scientific studies to warrant more detailed treatment and the subjects are unquestionably important. One suspects that the brevity of treatment here reflects only the fact that the author has already used seven hundred fifty pages before reaching this point in his manuscript and that pure limitations of space necessitated the meagre treatment of such rich topics as the psychology of art, music, religion, public opinion, and war.

In the introductory chapters of the book Burtt recognized the dilema of trying to deal with applied psychology without a foundation of statistical concepts. Some of these he has furnished incidently, but in a brief appendix he gives more detailed treatment of correlation techniques and methods of determining the significance of differences.

It is generally recognized that a critic of a general text sees more faults in those portions that touch particularly his own field of specialization than in other portions. With due recognition of this fact, the reviewer still feels that Burtt has dealt least effectively with applications of psychology to the field of education. It may be that the author has done this purposely on the ground that applied psychology in education is older and better represented by special textbooks than is applied psychology in other fields. Such an argument would be reasonable if the book were intended for professional readers. However, in his preface Burtt states that his book is intended particularly for two classes of readers—the college student who is meeting the applications of psychology for the first time, and the lay reader. The interest of such readers will not be attracted strongly to the field of education by Burtt's chapters.

Some of the techniques common to educational psychology are scattered through other parts of the book, and some topics

usually considered as educational psychology appear in the final chapter—"Outlying Fields." But in the main, it is Chapters 4, 5, and 6 that represent applications to education. Chapters 4 and 5, which deal with the concept of individual differences, are excellent. However, Chapter 6, "Learning From the Standpoint of the Educational System," does not reflect the research that has stemmed from educational psychology during the last thirty years, but rather gives mainly the principles borrowed from research in general psychology. This is not a criticism of such research or of the principles. It is a criticism of the omission of the most meaty research relating to educational problems and of the work of psychologists in the particular field of educational psychology. The applied psychology of learning is not adequately covered in Chapter 6. Furthermore, the rich materials in the psychology of growth and the treatment of emotions and adjustment as an educational process are inadequately covered. Students whose study of applied psychology is based on this book will find the fields of industrial and criminal psychology more adequately treated than the psychology of education.

Burtt's book raises some perplexing issues regarding the organization and treatment of the whole field of psychology. The diversity of applied interest in this field is impressive and also disturbing. Is there danger of this diversity becoming so great that the basic science underlying all the applications will be lost sight of? This problem is apparent both in the organization of the academic field of psychology and in the organization of the American Psychological Association. Is it better at this time to emphasize the diversity of applications or the common scientific core of psychology? How much of the graduate program of prospective psychologists should be given to the scientific study of psychological principles and methods common to all applications and how much to the strictly specialized techniques of one field? Is the Association overemphasizing the different applications of psychology through its many divisions? Immediate interest is unquestionably stimulated by specialization. The effect on the long-time development of psychology is not so clear. In addition to the unquestioned merit of Burtt's book for students and lay readers, there is also a contribution to the profession in clarifying the extent to which psychology has

now become diversified into so many applied fields and in raising a question regarding the significance of this diversification.

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*Ferment in Education.* The Problems, Responsibilities, and Opportunities of Universities in This Time; A Symposium at the Installation of George Dinsmore Stoddard as President of the University of Illinois. Urbana Ill.: University of Illinois Press, 1948, pp. 224

The titles of addresses and men presenting them are as follows: Ferment in education, George D. Stoddard; The sobering problems of education: Science, education, and the future of man, Anton J. Carlson; The education we need, Robert M. Hutchins; The terrible responsibility of the teacher, Archibald MacLeish; The race between education and catastrophe: Science in war and peace, James B. Conant; The source of a nation's strength, Omar N. Bradley; Low cost peace, Charles Luckman; Challenge to the Health Sciences: The meaning of cancer research, R. R. Spencer; The broader implications of ageing, E. V. Cowdry; Medical implications of atomic research, Austin M. Brues; New horizons in dental research, C. J. Van Slyke; The dental school of tomorrow, Harlan H. Horner; Pharmaceutical education and industrial research, George D. Beal; Educational responsibilities of the University of Illinois: A new era in education, Dwight H. Green; The meaning of public education, Coleman R. Griffith; A liberal education for medicine, Andrew C. Ivy; A forward look, George D. Stoddard.

Perhaps the central theme of these addresses is the responsibilities of universities in this time of seeming world crisis and the opportunities of universities in averting catastrophe and perchance marshalling our natural and human resources for a possible stabler and brighter future. For example, Carlson spoke to the rôle of science education in the preservation of the human race; Hutchins and Conant, to the selection, subsidation, and training of our highly talented youth; Bradley, to forthright education on the causes of war and realistic procedures (mental and material) for keeping the peace. The book invites sober reading.

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